

**Amendments to the Claims**

This listing of claims replaces prior versions:

Claim 1 (currently amended): An automatic programming apparatus for generating [[an]] a numerical control (NC) program for causing a cutting tool to machine a workpiece into a product shape having a recess and one or more protrusions formed in a bottom surface inside the recess, said automatic programming apparatus comprising:

a product shape data storing section for storing shape data defining said product shape;

a workpiece data storing section for storing data concerning the workpiece;

a tool data storing section for storing data concerning the cutting tool;

a machining condition data storing section for storing data concerning a machining condition having been set depending on said workpiece and cutting tool;

a cutter location (CL) data generating section for setting machining regions and then generating CL data containing at least a cutting tool to be used, a feed speed thereof, and traveling positions of said cutting tool to be used in a work coordinate system for each of said machining regions having been set, on the basis of said data stored in said product shape data storing section, said workpiece data storing section, said tool data storing section, and said machining condition data storing section; and

an NC program generating section for generating an NC program on the basis of the traveling positions in the work coordinate system contained in the CL data generated by said CL data generating section; wherein

said automatic programming apparatus further comprises:

a concave portion machining tool storing section for storing identification data of a plurality of cutting tools that are selected in advance as cutting tools to be used for the machining

of said recess from among the cutting tools, the data of which is stored in said tool data storing section, and that have diameters different from each other and include at least: a minimum diameter cutting tool having a diameter smaller than twice [[the]] a minimum curvature radius of a concave surface inside said recess of said product and than [[the]] a minimum distance of wall gaps inside said recess; and a cutting tool having a larger diameter than the minimum diameter cutting tool; and

    a machining time calculating section for calculating [[the]] a machining time on the basis of the CL data generated by said CL data generating section; wherein

    if a machining region having been set is said recess, said CL data generating section performs successively: a combination setting process of referring to the identification data stored in said concave portion machining tool storing section, thereby extracting one or more cutting tools from among a plurality of said cutting tools selected in advance, and thereby setting a plurality of cutting tool combinations including at least said minimum diameter cutting tool; and a CL data generating process of generating, for each of said combinations having been set, rough cutting CL data for rough cutting performed by the successive use of the cutting tools in [[the]] a descending order of cutting tool diameter starting with the cutting tool having [[the]] a maximum diameter, and then generating finishing CL data for finishing performed by the [[used]] use of said minimum diameter cutting tool; wherein

    said machining time calculating section calculates the machining time for each of said combinations on the basis of the CL data generated for each of said combinations; and wherein

    said NC program generating section generates said NC program by using the CL data having [[the]] a minimum machining time among those calculated by said machining time calculating section.

Claim 2 (currently amended): An automatic programming apparatus according to claim 1,  
wherein

    said concave portion machining tool storing section groups into a tool group a plurality of  
    said cutting tools selected as those to be used for the machining of said recess, and then stores  
    the identification data of constituent tools for each of ~~said~~ tool groups group the constituent tools  
    of which are different from each other, and wherein

    said CL data generating section receives from [[the]] an outside a signal for selecting ~~one~~  
~~from among a plurality of said tool groups a tool group~~, then refers to the identification data of  
    said tool group corresponding to said selection signal, stored in said concave portion machining  
    tool storing section, and thereby performs said combination setting process and said CL data  
    generating process successively.